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(54) Titre : COMPOSITIONS IGNIFUGES ET DE REVETEMENTS
(54) Title: FIRE RETARDANT AND COATINGS COMPOSITIONS

(57) Abrégé/Abstract:
This invention relates to an additive that can be admixed in or dissolved with a wide variety of paints and coating materials including solvent based paints such as epoxy, alkyd, urethane, polyurethane, acetonic, vinyl and nitrocellulosic, water-based paints, powder paints, caulking and fire stopping products to render such paint or coating material fire retardant. This flame retardant additive comprises a suitable charring agent such as penterythritol, a suitable blowing agent such as melamine, and melamine polyphosphate or a suitable chemical equivalent. This invention further relates to processes to correct the viscosity of the paint or coating material containing the fire retardant additive. This invention further relates to the process of adding the fire retardant additive to a paint or coating material to render the paint or coating material fire retardant.

FIRE RETARDANT AND COATINGS COMPOSITIONS

ABSTRACT

This invention relates to an additive that can be admixed in or dissolved with a wide variety of paints and coating materials including solvent based paints such as epoxy, alkyd, urethane, polyurethane, acetonic, vinyl and nitrocellulosic, water-based paints, powder paints, caulking and fire stopping products to render such paint or coating material fire retardant. This flame retardant additive comprises a suitable charring agent such as penterythritol, a suitable blowing agent such as melamine, and melamine polyphosphate or a suitable chemical equivalent. This invention further relates to processes to correct the viscosity of the paint or coating material containing the fire retardant additive. This invention further relates to the process of adding the fire retardant additive to a paint or coating material to render the paint or coating material fire retardant.

FIRE RETARDANT AND COATINGS COMPOSITIONS

FIELD OF THE INVENTION

This invention relates generally to paints and coatings capable of retarding the spread of fire. More particularly, this invention relates to additives that can be admixed with or dissolved in compositions for paints and other surface coatings (including fire stopping products) to render them fire retardant.

BACKGROUND OF THE INVENTION

Fire retardant compositions of various sorts are known for use in surface coatings. A preferred category of fire-retardant paints is intumescent paints. An intumescent paint protects the substrate to which it is applied by forming an insulating, protective layer over the substrate when exposed to high temperatures. Some of the composite fire retardant additives suitable for intumescent paints include a suitable charring agent such as penterythritol and a suitable blowing agent (which upon heating exudes a gas that forms gas pockets within the protective layer) such as melamine. Any such fire retardant composition should resist combustion while substantially maintaining the desirable physical properties of the coating.

Currently, there are no suitable additives known for general use in many different types of paints or coatings, to render such coatings fire retardant without significantly adversely affecting

the desirable physical properties of the coatings.

Melamine polyphosphate is known but not for use as a fire retardant in surface coating compositions. Its use heretofore has been in fire retardants for polyester and polyamide compositions. DSM Melapur, Freehold, N.J., a commercial manufacturer of melamine polyphospate, claims that there is also a potential use of melamine polyphosphate in thermoplastic materials, epoxy and urethane resins for use in the textile industry. None of the prior literature or use of melamine polyphosphate suggests that anyone has perceived that the compound could be used as a fire retardant in surface coating compositions.

SUMMARY OF THE INVENTION

According to a first aspect of the invention, melamine polyphosphate or a suitable chemical equivalent thereof is used in paint or other coating compositions as a fire retardant additive, preferably in combination with other known fire retardant chemicals. If used in combination with other fire retardants, the melamine polyphosphate may be present in an amount ranging from about 5% to about 75% of the total fire retardant composition. The fire retardant composition in the overall surface composition may substitutionally replace some portion of the dried powder components that would otherwise be present in the surface composition in an amount ranging from about 5 to about 40 weight percent of the dried powder components as found in the original paint or other coating composition.

According to another aspect of the invention, a fire-retardant composition as described herein may be used as a composite additive that renders paints and coatings including fire stopping

products, fire retardant while substantially maintaining the physical properties of the coating. The additive has three principal components: (1) about 10 to about 65 weight percent of a suitable charring agent such as penterythritol; (2) about 10 to about 65 weight percent of a suitable blowing agent such as melamine; and (3) about 5 to about 75 weight percent of melamine polyphosphate or a suitable chemical equivalent thereof. In conformity with the above guidelines, the fire retardant composition in the overall surface composition may substitutionally replace the dried powder components in an amount ranging from about 5 to about 40 weight percent of the dried powder components as found in the original paint or other coating composition. A suitable amount of thixotropic chemicals is then added to ensure the fire retardant paint or other coating has an appropriate viscosity.

According to another aspect of the invention, the amount of thixotropic chemicals needed for an appropriate viscosity of the fire retardant paint or other coating is ascertained. First the original paint or other coating is altered by removing from between 5% and about 40% by weight of the dried powder components and all thixotropic chemicals. The fire retardant composition is then substitionally added to approximately compensate for the dried powder components removed. A person skilled in the art may then add suitable thixotropic chemicals to the paint or other composition until the appropriate viscosity is obtained.

DETAILED DESCRIPTION

In one embodiment of the invention, a composite additive that renders paints and other coatings including fire stopping products fire retardant through intumescence is provided. The composition has three principal components: (1) a suitable charring agent such as penterythritol;

(2) a suitable blowing agent such as melamine; and (3) melamine polyphosphate or a suitable chemical equivalent thereof. The first component, penterythritol, is present in an amount of about 10 to about 65 weight percent of the fire retardant additive. The second component, melamine, is present in an amount of about 10 to about 65 weight percent of the fire retardant additive. The third component, melamine polyphosphate or equivalent, is present in an amount of about 5 to about 75 weight percent of the fire retardant additive.

As mentioned above, an intumescent paint protects the substrate to which it is applied by forming an insulating, protective layer over the substrate when exposed to high temperatures. In the associated chemical reaction that occurs at high temperature, melamine polyphosphate acts as a foaming agent, penterythritol is a polyhydric alcohol that acts as a carbonific or charring agent, and melamine acts as a blowing agent gas source. It is expected that other charring agents and blowing agent gas sources could be used in substitution for penterythritol and melamine, but any such substitute should be empirically evaluated to satisfy the composition manufacturer that such substitution does not adversely affect the fire retardant capabilities or the physical properties of the paint or other coating.

Compositions according to the present invention can be used with a wide variety of coatings, including solvent-based paints such as epoxy, alkyd, urethane, polyurethane, acetonic, vinyl and nitrocellulosic as well as water-based paints, powder paints, caulking and fire stopping products. There are no suitable additives known that can be generally used in many different types of paints or coatings to render such fire retardant without significantly affecting the physical properties of the coating.

A fire retardant additive according to the invention is added to the paint or other coating (herein paint will be used as an example, but it is to be understood that other surface coatings lend themselves to inclusion of a fire retardant composite additive of the sort described herein) at the manufacturing stage by substituting a flame retardant composition according to the invention for non-volatile components in the paint composition. The substitution is quantitatively selected so as to approximately maintain the ratio by weight of dried powder components to other components as found in the original paint composition without such fire retardant additive composition. In the preferred embodiment, this is done by substituting a fire retardant composition according to the present invention for titanium dioxide (TiO_2) or other dried powder fillers present in the original paint composition in the amount of about 5 to about 40 weight percent of the original dried powder components. If the ratio of non-volatile components is not approximately maintained, then the physical characteristics of the paint, such as drying capabilities, gloss, surface covering capability, durability and hardness, will be adversely affected, possibly rendering the paint useless for practical purposes.

If the ratio of non-volatile components in the paint is approximately conserved as compared to the original paint, there should generally be little effect on the physical characteristics of the fire retardant paint with two exceptions: viscosity and gloss. The viscosity of the paint containing a composition according to the present invention is generally adversely affected such that it becomes difficult to apply the paint to a substrate with rollers or brushes. This problem may be corrected by varying the amount of thixotropic chemical as found in the original paint. Each paint and coating is unique, requiring a different amount of the thixotropic chemical to correct for any viscosity problems created by the addition of a composition according to the present invention.

The appropriate amount of thixotropic chemicals needed can be ascertained in three steps. First, a sample of the original paint is manufactured without any thixotropic chemicals added and missing about 5 to about 40 weight percent of the dried powder components. Second, the fire retardant composition of the present invention is added in an equivalent amount by weight to the amount of dried powder components missing from the paint composition. Third, a person skilled in the formulation of paint mixtures adds thixotropic chemicals until the paint composition attains an appropriate viscosity. Once the viscosity is corrected, the physical properties of the newly created fire retardant paint should be substantially identical to the original paint with the possible exception of the gloss. Preservation of the gloss of the original coating composition without the fire retardant additive is the only problem associated with the use of the present invention that is not readily correctable. The addition of a composition according to the present invention to a paint or coating generally reduces the gloss level by approximately one degree. In general, the gloss level is affected to a lesser extent in darker paints and for some types of paints, such as polyurethane paints, there is substantially no difference in the gloss.

Penterythritol is available commercially from Chemko Strazske, Republic of Slovakia. Melamine is available commercially from DSM, Netherlands. Melamine polyphosphate is available commercially from DSM Melapur, Freehold, N.J. and can be purchased as either Melapur 200/70 or Melapur 200. Melapur 200/70 and Melapur 200 only differ in particle size and each can be used in a composition according to the present invention.

Coatings containing fire retardant additives in accordance with the present invention are flame retardant according to the United Kingdom standards, BS 476: Part 7 (British Standard Fire test on building materials and structures: Method of test to determine the classification of the

surface spread of flame of products) as well as the standards in the United States, ASTM E84 (Standard Test Method for Surface Burning Characteristics of Building Materials) and in Canada, CAN/ULC-S102 (Standard Method of Test for Surface-Burning Characteristics of Building Materials and Assemblies) and CAN/ULC-S102.2 (Standard Method of Test for Surface-Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies).

EXAMPLE

In a preferred example of the present invention, penterythritol as the charring agent will be present in the amount of about 30 to about 40 weight percent of the fire retardant composition, melamine as the blowing agent will be present in the amount of about 30 to about 40 weight percent of the fire retardant composition and melamine polyphosphate will be present in the amount of about 25 to about 35 weight percent.

Titanium dioxide or other suitable filler is removed from the original paint composition in the amount of about 10 to about 20 weight percent of the dried powder components. The thixotropic chemicals present in the original paint composition are also removed. The dried powder components are then replaced by an equivalent amount by weight of fire retardant compositions according to the present invention. A suitable amount of thixotropic chemicals is then added.

A suitable amount of thixotropic chemicals is ascertained in three steps. First, the thixotropic chemicals and titanium dioxide or another suitable filler is removed as in the immediately preceding paragraph. Second, the fire retardant composition as described in the present invention is added in the amount described in the immediately preceding paragraph.

Finally, a person skilled in the art adds suitable thixotropic chemicals to the paint composition until the paint develops an appropriate viscosity.

CLAIMS

What is claimed is:

1. An additive for a coating material fire retardant comprising:

   (1) about 10 to about 65 weight percent of a suitable charring agent;

   (2) about 10 to about 65 weight percent of a suitable blowing agent;

   (3) about 5 to about 75 weight percent of melamine polyphosphate or suitable chemical equivalent.

2. The additive of claim 1 wherein the charring agent is penterythritol.

3. The additive of claim 1 wherein the blowing agent is melamine.

4. The additive of claim 2 wherein the blowing agent is melamine.

5. A method for determining how to correct the viscosity of a fire retardant coating material containing an additive of any of claims 1-4 comprising the following steps:

   (1) make the original non-fire retardant coating material without any thixotropic chemicals added and with about 5 to about 40 weight percent of the dried powder components missing;

   (2) replace the said missing dried powder components by adding a substantially equivalent amount by weight of additive as in any of claims 1-4;

   (3) add thixotropic chemicals until the coating material has an appropriate viscosity.

6. The method of claim 5 wherein the dried powder component missing from the original coating material is titanium dioxide or other filler present in the original coating material..

7. A method for creating a fire retardant coating material containing the additive as in any of

claims 1-4 comprising the following steps:

(1) make the original non-fire retardant coating material without any thixotropic chemicals added and with about 5 to about 40 weight percent of the dried powder components missing;

(2) replace the said missing dried powder components by adding a substantially equivalent amount by weight of additive as in any of claims 1-4;

(3) add the amount of thixotropic chemical as determined by the method of either of claims 5-6.

8. The method of claim 7 wherein the dried powder component missing from the original coating material is titanium dioxide or other filler present in the original coating material.